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SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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02/809,463 07/18/97 NAKAMURA M P97.0322

E1M1/0305

HILL STEADMAN & SIMPSON
85TH FLOOR SEARS TOWER
CHICAGO IL 60606

EXAMINER

KELLEY, N

ART UNIT

PAPER NUMBER

2503

7

DATE MAILED: 03/05/98

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☒ This application has been examined ☐ Responsive to communication filed on _____ ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), 0 days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- ☒ Notice of References Cited by Examiner, PTO-892.
- ☒ Notice of Draftsman's Patent Drawing Review, PTO-948.
- ☒ Notice of Art Cited by Applicant, PTO-1449.
- ☐ Notice of Informal Patent Application, PTO-152.
- ☐ Information on How to Effect Drawing Changes, PTO-1474.
- ☐

Part II SUMMARY OF ACTION

- ☒ Claims 1-19 are pending in the application.
Of the above, claims _____ are withdrawn from consideration.
- ☐ Claims _____ have been cancelled.
- ☐ Claims _____ are allowed.
- ☒ Claims 1-19 are rejected.
- ☐ Claims _____ are objected to.
- ☐ Claims _____ are subject to restriction or election requirement.
- ☐ This application has been filed with Informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.
- ☐ Formal drawings are required in response to this Office action.
- ☒ The ~~entire set of~~ substitute drawings have been received on 4/21/97. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable; ☒ not acceptable (see explanation or Notice of Draftsman's Patent Drawing Review, PTO-948).
- ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____, has (have) been ☐ approved by the examiner; ☐ disapproved by the examiner (see explanation).
- ☐ The proposed drawing correction, filed _____, has been ☐ approved; ☐ disapproved (see explanation).
- ☒ Acknowledgement is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☒ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____.
- ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
- ☐ Other

EXAMINER'S ACTION

8/25941.3

Art Unit: 2503

Claims 1-19 are pending in this application.

Claims 6 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 4 and 14 are indefinite for introducing an element ("a metal nitride film") which was previously introduced (in claims 1 and 10, respectively).

Claims 6 and 16 are indefinite for introducing an element ("a metal film") which was previously introduced (in claims 4 and 14, respectively).

Claims 5, 7, 8, 15, 17, and 18 are rejected as per claims from which they depend.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 3, 4, 7, 9, 10, 11, 12, 13, 14, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. (U.S. #5,098,859; "Jackson") in view of Nirschl et al. (DE 41 29 647 A1; "Nirschl").

Jackson discloses a device including a GaAs substrate, a non-single crystal semiconductor layer (see, for example, "EXAMPLE 3" as well as col. 5, line 56), and an uppermost conductive film. With respect to claims 9 and 19, note figure 2. Jackson fails to teach the claimed details of

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the uppermost conductive film (Jackson's "Metal 1"). Nirschl teaches a metal film structure for making contact with III-V semiconductor regions. Nirschl's structure includes a first metal layer (2), a nitride layer (5), an adhesion layer (6) and a second metal layer (4). Nirschl teaches that such a contact structure allows for reliable operation at high temperatures. It would have been obvious to one skilled in the art at the time the invention was made to form the device as disclosed by Jackson with a conductive film structure as taught by Nirschl because Nirschl teaches that such a contact structure can be used to contact III-V material and allows for reliable high temperature operation. With respect to claims 7 and 17, while Nirschl uses a metal and nitride other than those claimed by applicant, the claimed metals and nitrides are well known in the art and their use in Nirschl's structure would have been obvious to a skilled artisan at the time of invention as a result of routine engineering design, optimization, and implementation considerations.

Claims 5, 6, 8, 15, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson and Nirschl and further in view of Ishihara (kokai 59-66166).

Jackson and Nirschl teach a device as claimed, but fail to specify that the adhesion layer is formed of a refractory metal (or, for that matter, what refractory metal). Ishihara teaches a related prior art structure which uses titanium as an adhesive layer (the examiner notes the while the English abstract refers to the adhesive force of the uppermost layer, one skilled in the art would readily understand that the adhesive force is a result of layer 7). It would have been obvious to one skilled in the art at the time the invention was made to form the device collectively taught by

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Jackson and Nirschl with a refractory metal layer as Nirschl's adhesive layer due to Ishihara's successful use of such a material for such a layer in a related prior art device. With respect to claims 8 and 18, while Ishihara's uses a refractory metal other than that claimed, the claimed refractory metals are well known in the art and their use in the collectively taught structure would have been obvious to a skilled artisan at the time of invention as result of routine engineering design, optimization, and implementation considerations.

Yamagishi (kokai 62-213,155) has been cited for teaching the use of a nitride/metal film as a contact to a III-V material structure.

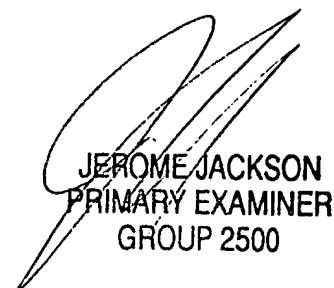
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan Kelley whose telephone number is (703) 305-3789. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



N. Kelley

February 26, 1998



JEROME JACKSON
PRIMARY EXAMINER
GROUP 2500